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ECOLOGICAL
RESEARCH PROGRAM

ECOSYSTEM SERVICES RESEARCH IN COMMUNITIES: COASTAL CAROLINAS STUDY

Issue

The Ecological Research Program (ERP) in EPA's Office of Research and Development (ORD) is identifying and characterizing the services that ecosystems provide and identifying the value that these services represent to human health and well-being. The research will result in new tools and information to help decision makers evaluate the full costs and benefits of decisions which impact these ecosystems.

As part of this effort, research will be conducted in the coastal counties of North and South Carolina to develop an inventory of the services provided by the region's ecosystems. Scientists also will develop information to document the value of these services and will begin to quantify the impacts on these services caused by changes in human populations, agricultural practices, and climate change. Special emphasis will be given to coastal area wetlands and, in particular, to the role of wetlands in controlling reactive nitrogen, an important environmental stressor associated with agricultural fertilizer application, air pollution, and water quality problems.

The North and South Carolina coastal counties represent an ideal area for studying ecosystem services and the factors that impact these systems. This area contains extensive natural landscapes that are facing unprecedented pressures from population growth, landscape alteration, and climate change. This area includes the tidal counties from Currituck Sound south to the Savannah River. It also includes the Albemarle and Pamlico Estuaries, Cape Hatteras, and the Outer Banks and the major cities of Wilmington, Myrtle Beach, and Charleston.

Loss or impairment of coastal wetlands can lead to many adverse outcomes with real costs to human well-being, including reduced water quality and quantity, harmful algal blooms, loss of habitat, and reduced fish populations, impacting commercial harvests and recreational sport fishing.

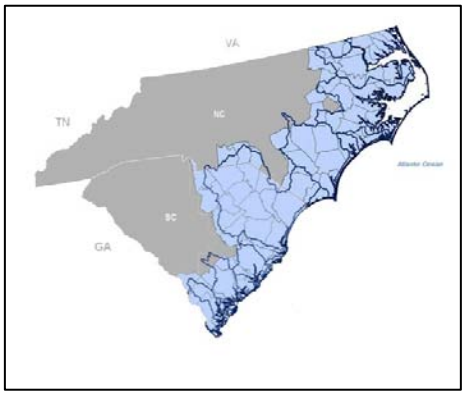

Figure 1 North and South Carolina Coastal Area in blue

Nitrogen

Studying regional variations in land use and agricultural practices and associated ground and surface water quality allows scientists to map and model the source, movement, and interaction of nutrients, sediments, and other substances within coastal landscapes. Agricultural practices within the floodplains of North and South Carolina include extensive areas with relatively high densities of concentrated animal feedlot operations (CAFOs) which can be major sources of ammonia emissions (a form of reactive nitrogen) and contribute to regionally

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high levels of nitrogen being deposited from the air. In addition, a shift from food crops, such as corn and soybeans, to production of high-ethanol corn for use in biofuel production also is occurring. This practice is associated with increases in nitrogen fertilization which can impact local groundwater, streams, and rivers, as well as water quality in downstream bays and estuaries, potentially resulting in large algal blooms and fish kills.

Wetlands

Coastal wetlands filter sediments, absorb excessive nutrients, convert reactive nitrogen compounds to non-reactive nitrogen, and detoxify water-borne contaminants, as well as contribute to water storage, carbon accumulation, oxygen production, storm surge protection, and provide essential nursery grounds and habitat for commercial and recreational fish populations. The coastal wetlands of North and South Carolina provide a unique opportunity to identify and quantify the many services that these natural systems provide for the benefit of human health and the environment.

Science Objective

The goals of the Coastal Carolinas initiative are to:

- Identify and characterize coastal ecosystems services, with an emphasis on wetlands ecosystems.
- Establish the relative values represented by coastal ecosystem services.
- Identify the impacts of global, national, regional, and locally interacting actions and decisions on coastal ecosystems services, with emphasis on reactive nitrogen sources and cycles.
- Develop information and decision tools (including the ability to visualize alternative future scenarios) and make these available to managers and citizens for use in assessing the full cost of land-use decisions.

Research questions include:

- What are the coastal ecosystem functions which support or provide goods and services?
- What are the relative values of coastal ecosystems services?
- How can we predict the impact of management decisions on coastal ecosystem services and related benefits and costs?
- How can we make this information available in a useful and usable form?

Application and Impact

The Coastal Carolinas study is focused on identifying and quantifying ecosystem services to support decisions that promote sustainable coastal communities and good stewardship of the land.

This research will provide useful and usable information and tools for policy decision makers and others to determine the real value of ecosystem services and the probable future impacts and costs of decisions under a variety of alternative land-use scenarios.

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DECEMBER 2007